

# Astronomy & Physics Division Overview

Presented to

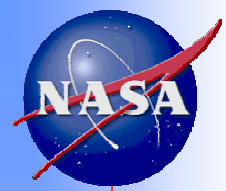
OS/SEUS

Dr. Anne L. Kinney

Director

Astronomy and Physics Division

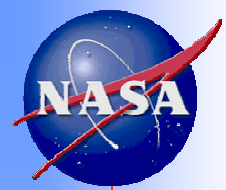
July 1, 2003



# Introduction

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- Beyond Einstein
- Fabulous Science and Press Results
- Launches
- Challenges/Solutions
- Reviews and Blue Ribbon Panel

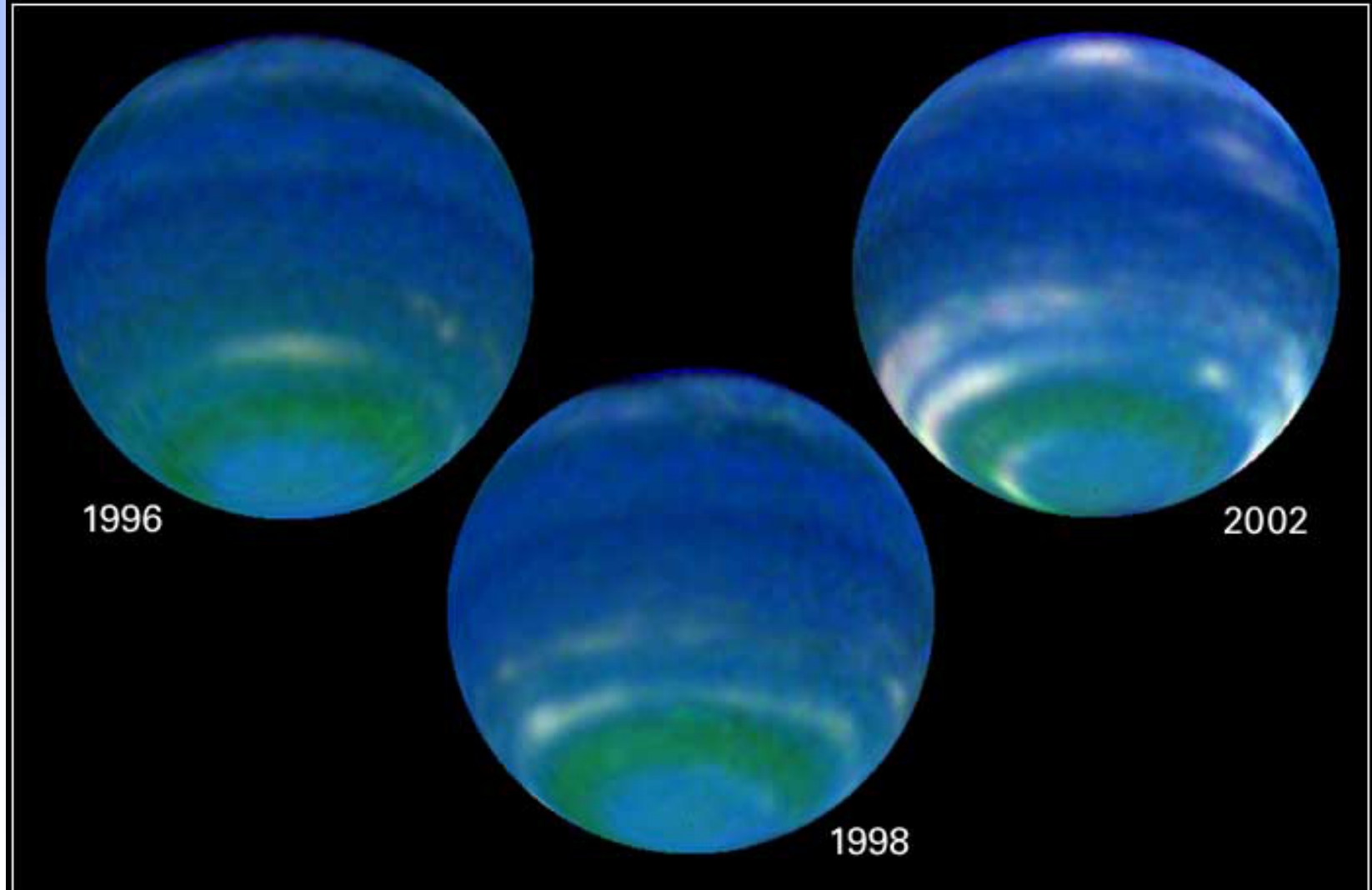


# Science Highlights:

## HST: Planetary Change of Seasons

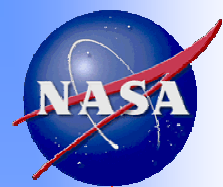
Neptune

Hubble Space Telescope ■ WFPC2

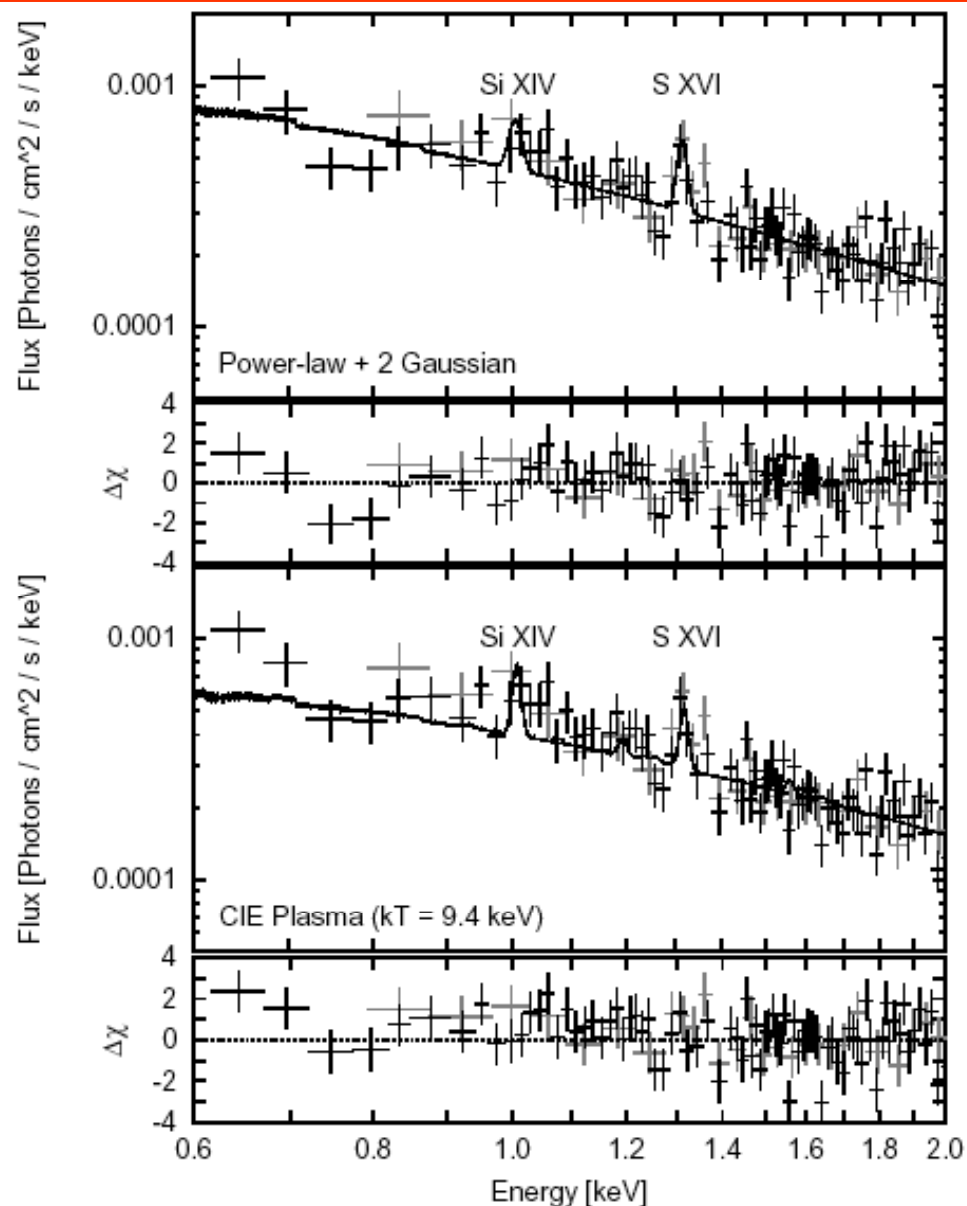


NASA, L. Sromovsky and P. Fry (University of Wisconsin)

STScI-PRC03-17

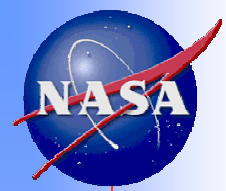


# Science Highlights: HETE



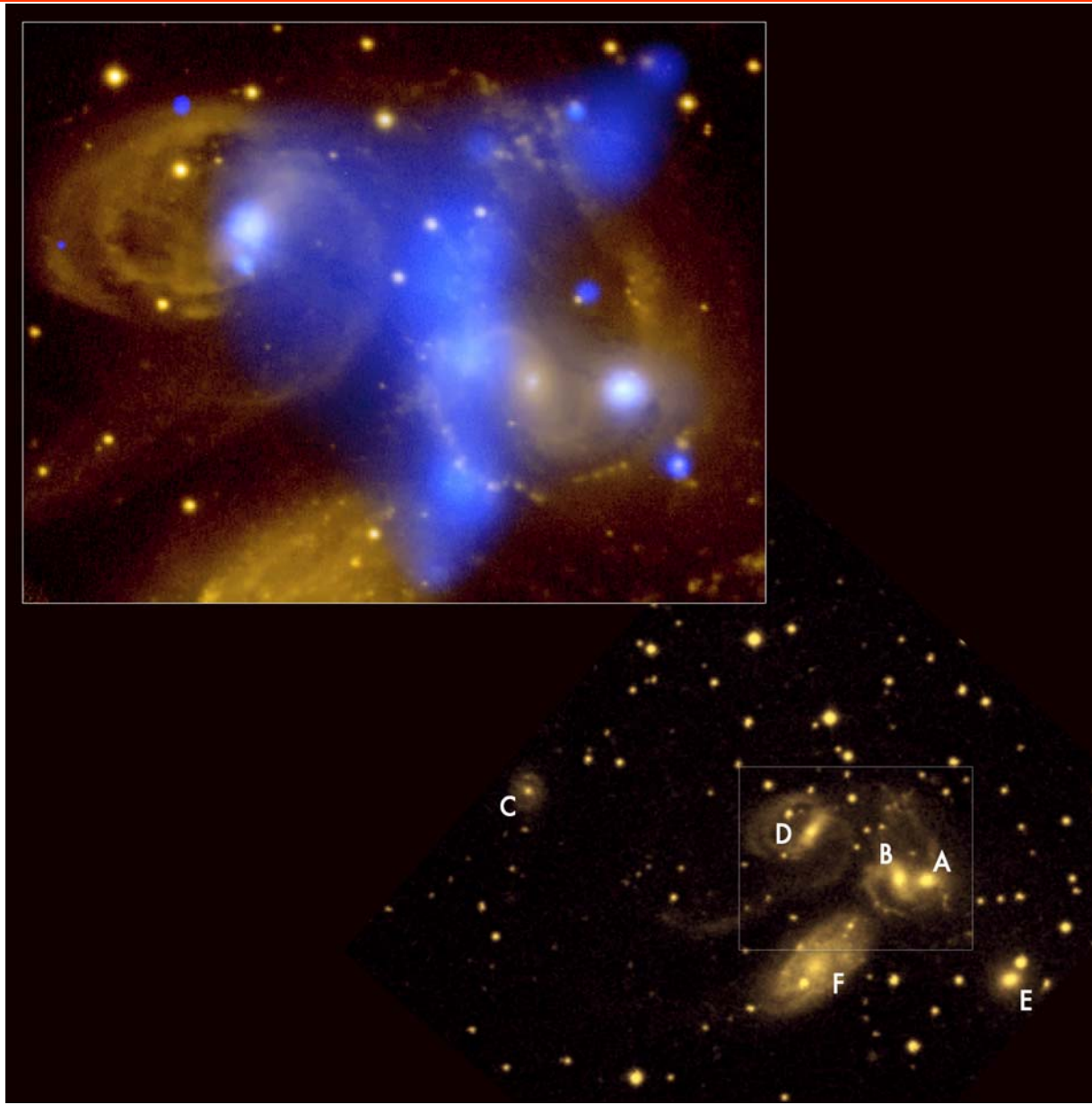
## GRB Associated with Supernova

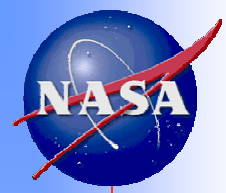
- GRB020813 is HETE detected long duration burst.
- Chandra HETGS spectral observations of afterglow.
- Low -z metals (S and Si) detected, but not Fe.
- Lines associate burst with a supernova.
- Lack of iron suggest burst occurred  $\lesssim 2$  months after supernova ( $\text{Ni}^{56}_{6d} \rightarrow \text{Si}^{56}_{78d} \rightarrow \text{Fe}^{56}$ )



# Science Highlights:

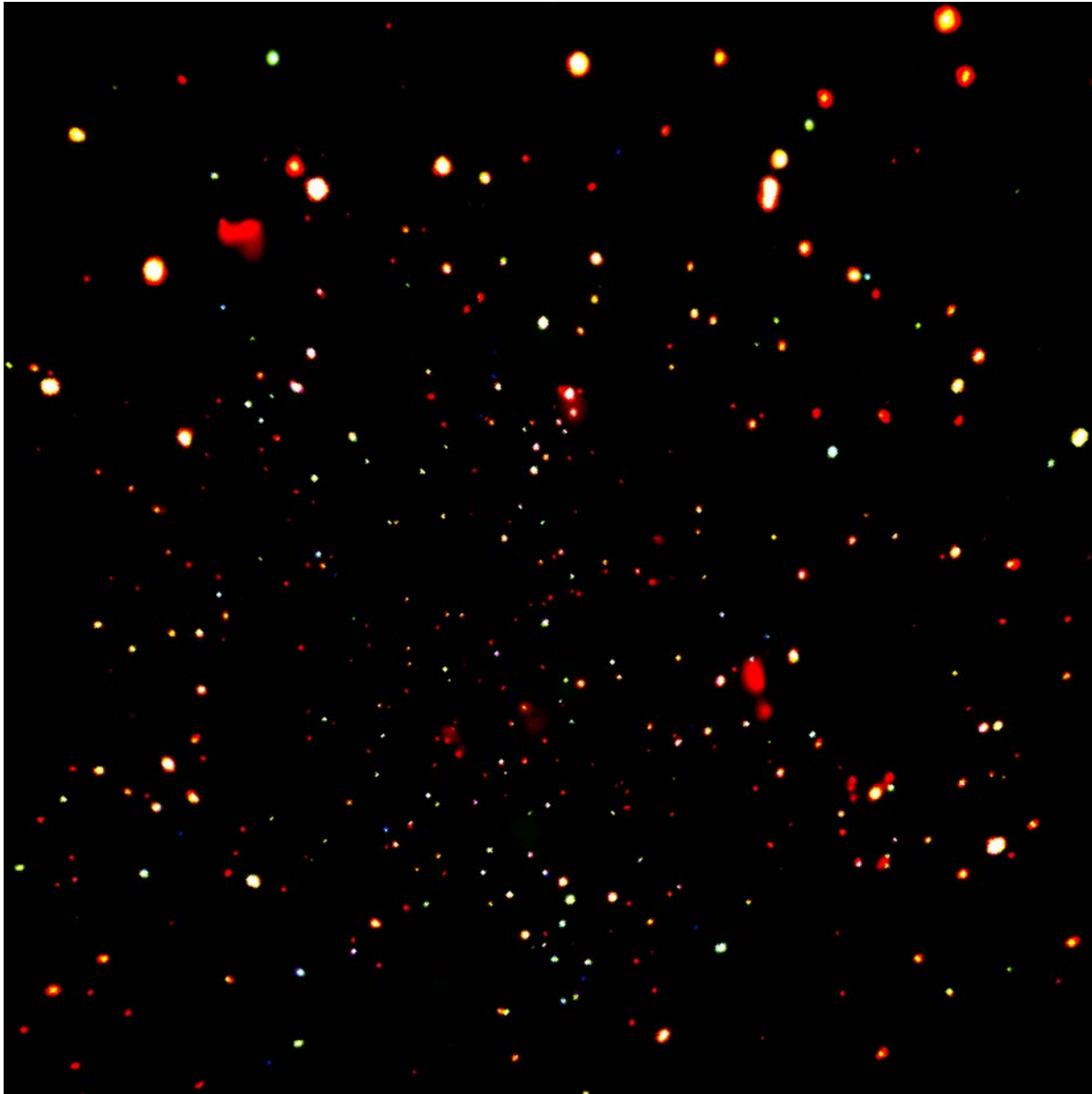
## Chandra - Stephan's Quintet



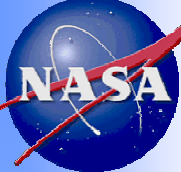


# Science Highlights: Chandra Deep Field North

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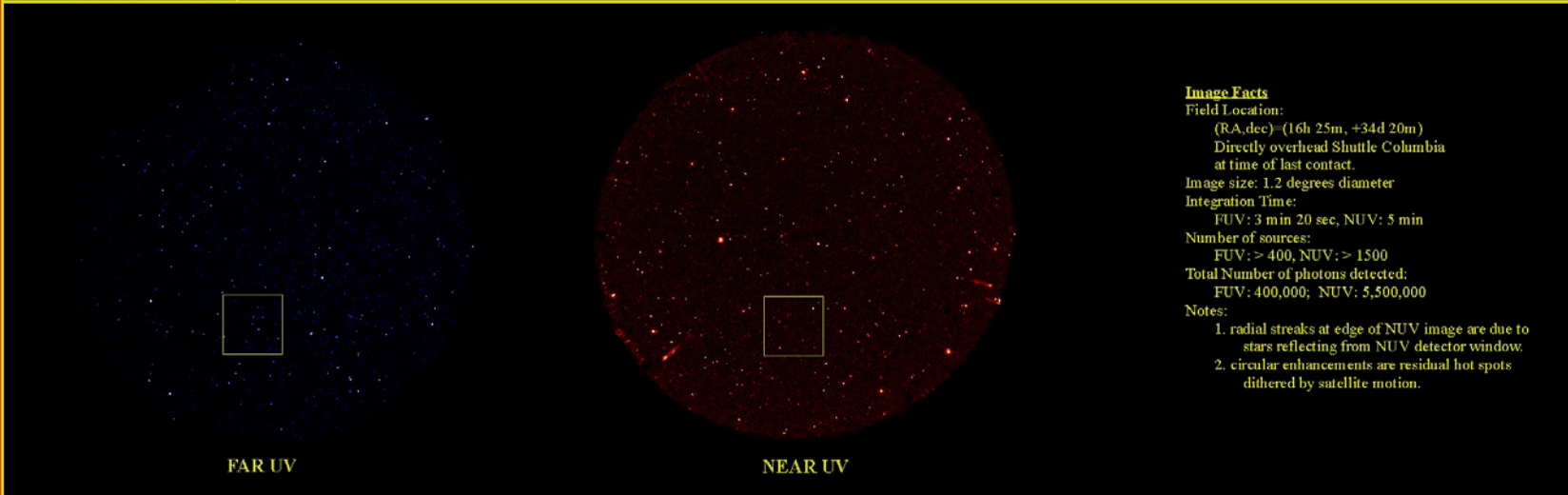
# Science Highlights: GALEX First Light



**GALAXY  
EVOLUTION  
EXPLORER**

## FIRST LIGHT IMAGES

*FIELD DEDICATED TO SHUTTLE COLUMBIA ASTRONAUTS*



### Image Facts

Field Location:

(RA,dec) = (16h 25m, +34d 20m)  
Directly overhead Shuttle Columbia  
at time of last contact.

Image size: 1.2 degrees diameter

Integration Time:

FUV: 3 min 20 sec, NUV: 5 min

Number of sources:

FUV: > 400, NUV: > 1500

Total Number of photons detected:

FUV: 400,000; NUV: 5,500,000

Notes:

1. radial streaks at edge of NUV image are due to stars reflecting from NUV detector window.
2. circular enhancements are residual hot spots dihedered by satellite motion.

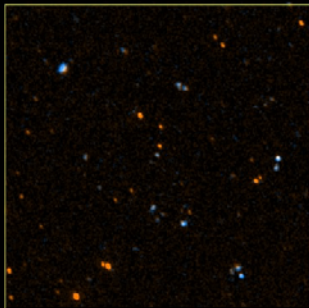
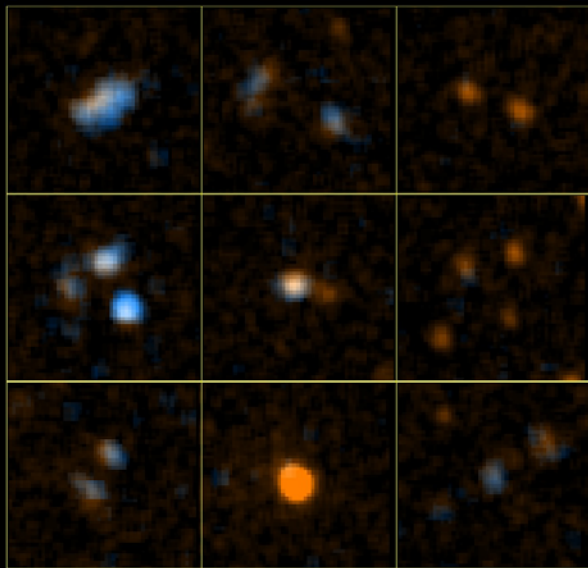


Image size: 13 x 13 arcminutes  
True color image, with red sources brighter in Near UV channel, and blue sources brighter in Far UV channel. This represents about 1/30th of the total image area. A number of interacting galaxy pairs and triplets may be present in the field. These could also be individual star formation regions in single galaxies that will become apparent with deeper imaging.



Blowup of region, displayed in true color using both bands. 13 x 13 arcminutes. More than 100 objects are visible in this region. Blue objects are bright in FUV channel, red in NUV channel. Most objects are galaxies, and clustering is visible. Small misalignments are still present in these preliminary images.



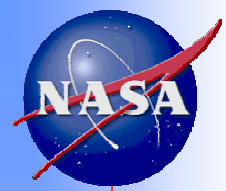
Details of small (77 x 77 arcsec) regions around detected objects. The description gives some possible explanations for each object.

Left-to-right:

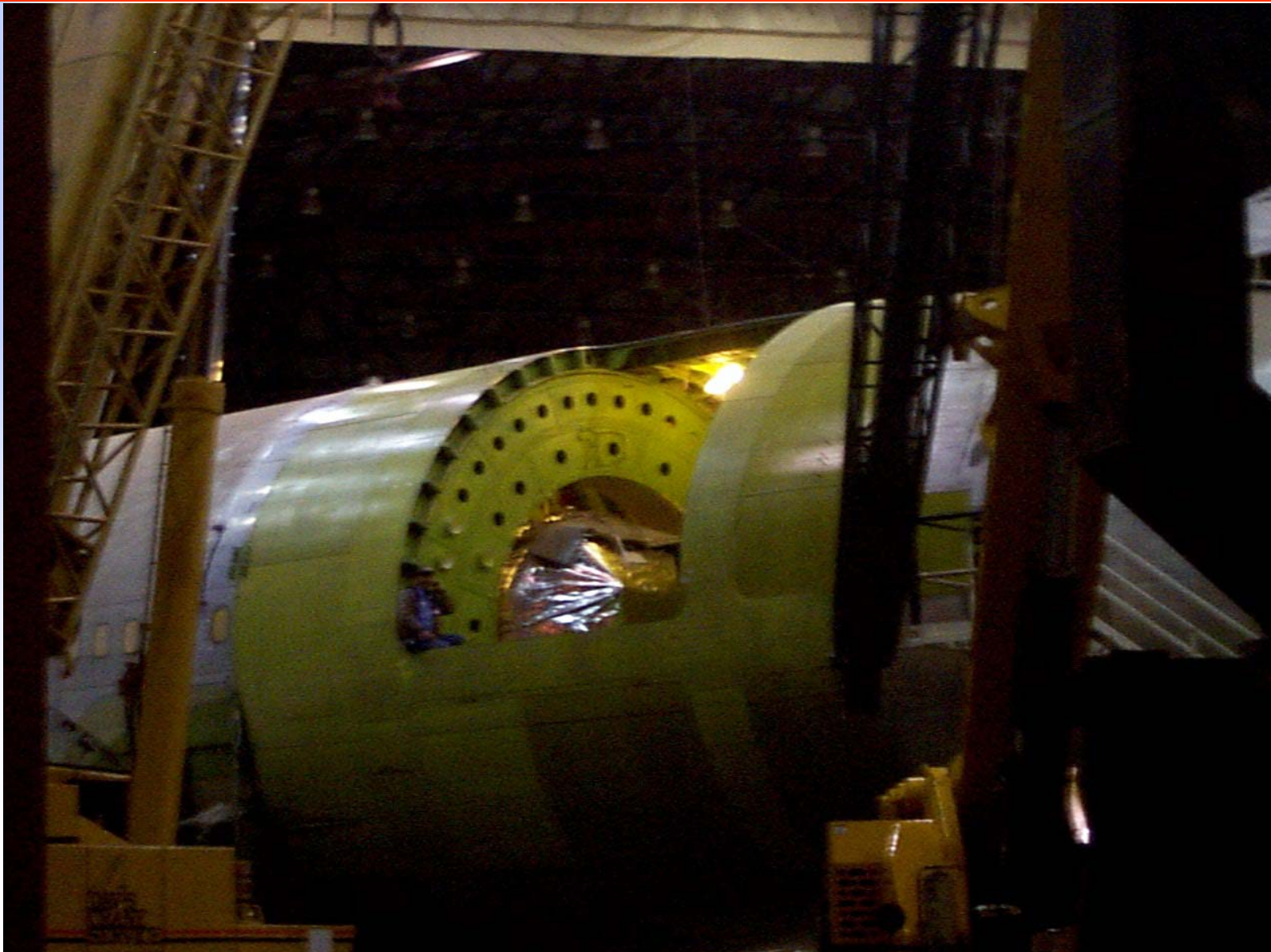
TOP: resolved galaxy, galaxy pair, red galaxy pair.

MIDDLE: interacting galaxy group or large galaxy with star forming regions; small galaxy; 4 red galaxies in a group?

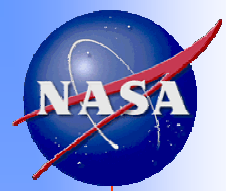
BOTTOM: galaxy pair; red star; galaxy quartet?



# Science Highlights: SOFIA Telescope Support Installed







# Space Science Updates

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Chandra: Merging Supermassive Black Holes      November 19, 2002

WMAP: Universe's Baby Picture      February 11, 2003

HETE: Nearby Gamma Ray Burst      March 19, 2003

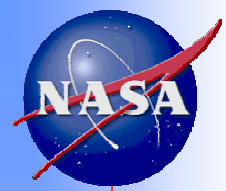
RXTE: Cosmic Speed Limit on Pulsars      July 2, 2003

Hubble: Planet related      July 10, 2003

Note:

6 SSU's in SEU this year.

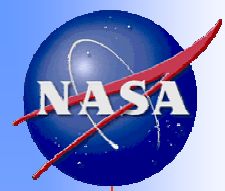
5 SSU's in Origins this year.



# 2003 Space Science Launches

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- CHIPSat - Launched from VAFB January 12.
- GALEX - Launched from CCAFS April 28.
- Mars Rover Spirit - Launched from CCAFS June 10.
- Mars Rover Opportunity - Scheduled from CCAFS July 2.
- SIRTf - Scheduled from CCAFS August 23.
- Gravity Probe B - Scheduled from VAFB NET November 20.
- SWIFT - Scheduled from CCAFS January 2004.
- CINDI - Scheduled from KWAJ January 23, 2004.



# Upcoming Launch Mars Exploration Rovers

## Launches:

MER A (Spirit): NET June 10, 2003 ✓

MER B (Opportunity): July 2, 2003

Cape Canaveral, FL.

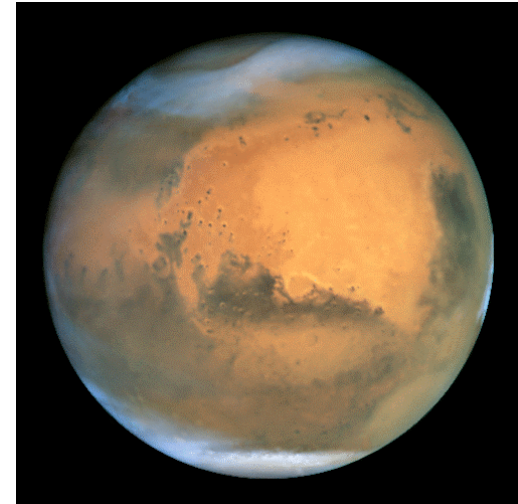
## Launch vehicles:

Delta II

## Primary Science Objective:

Looking for Signs of Past  
Water on Mars.

The big science question for  
the Mars Exploration Rovers  
is how past water activity on  
Mars has influenced the red  
planet's environment over time.



# Upcoming Launch SIRTF

## Launch:

August 23, 2003  
Cape Canaveral, FL.

## Launch Vehicle:

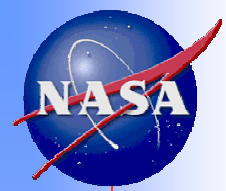
Delta II Heavy

## Primary Science Objective:

SIRTF will obtain images and spectra by detecting the infrared energy, or heat, radiated by objects in space.

Most infrared radiation is blocked by the Earth's atmosphere and cannot be observed from the ground.





# Upcoming Launch GP-B

Launch:

November 20, 2003

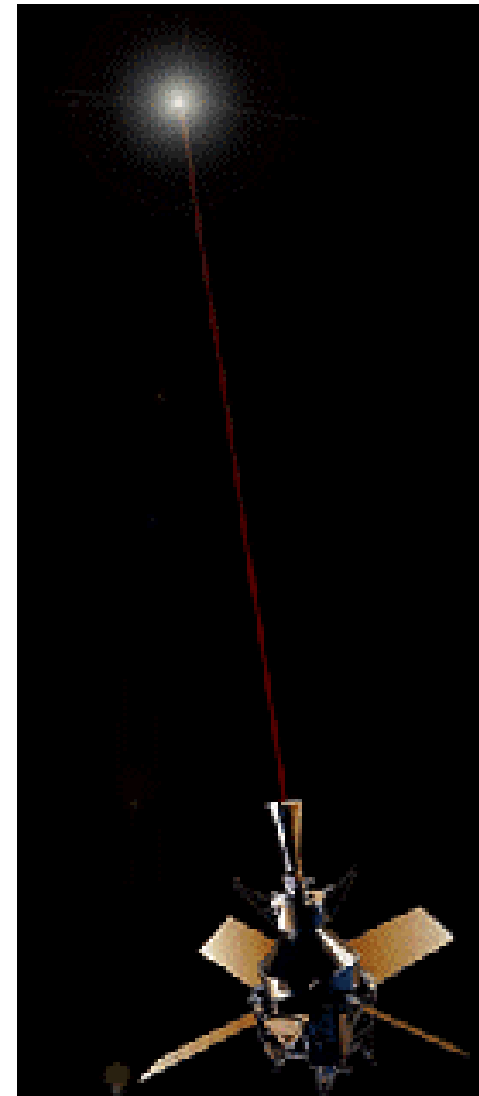
VAFB, CA.

Launch Vehicle:

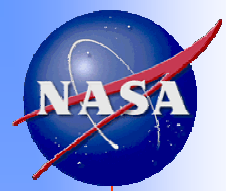
Delta II

Primary Science Objective:

Gravity Probe B uses four gyroscopes developed to test two predictions of Albert Einstein's general theory of relativity. While in a polar Earth orbit, it will measure how space and time are warped by the presence of the Earth, and how the Earth's rotation drags space-time around with it.







# Upcoming Launch SWIFT

Launch:

January 2004

Cape Canaveral, FL.

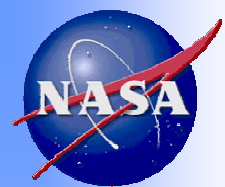
Launch Vehicle:

Delta 7320

Primary Science Objective:

The primary objective of the SWIFT mission is to determine the origin of Gamma Ray Bursts and to use them to probe the early universe.



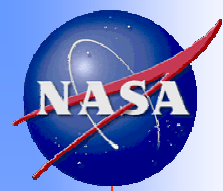


# Astronomy and Physics Operating Missions Status

Launch/Phase		Apr	May	Jun	STATUS
HST	04/25/90	GRN	GRN	GRN	
	Prime				
Rossi XTE	12/30/95	GRN	GRN	GRN	
	Extended				
2MASS	04/01/97	GRN	GRN	GRN	
	Extended				
SWAS	12/3/98	GRN	GRN	GRN	
	Extended				
FUSE	06/24/99	GRN	GRN	GRN	
	Extended				
Chandra XO	7/19/99	GRN	GRN	GRN	High solar radiation event on 5/31 caused loss of 95 ksec science time. Cycle 5 review week of 6/22.
	Prime				
XMM-Newton	12/09/99	GRN	GRN	GRN	
	Prime				
HETE-2	10/08/00	GRN	GRN	GRN	
	Extended				
WMAP	06/30/01	GRN	GRN	GRN	
	Prime				
Integral	10/17/02	GRN	GRN	GRN	
	Prime				
CHIPS	1/15/03	GRN	GRN	GRN	
	Prime				
GALEX	4/28/03			GRN	
	Prime				

GRN

Proceeding on Plan, only normal, minor problems

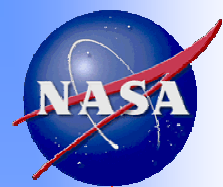


# Structure and Evolution of the Universe

## Developmental Mission Status

	Launch	Apr	May	Jun	STATUS
GP-B	Nov '03	RED	YEL	YEL	Completed penalty T/V, accessing results. Star tracker anomaly reoccured. SIM 5 went very well.
SWIFT	Dec '03	GRN	YEL	YEL	Launch date moved to January 15, 2004. BAT has no schedule reserve.
Astro-E2	Feb '05	YEL	YEL	YEL	XRS PER held June 19, 2003, XRT vibration anomaly being investigated.
SPIDR	Jun '05	RED	BLK		Termination Letter sent to PI and GSFC on May 16th.
GLAST	Sep '06	GRN	YEL	YEL	NAR successfully held June 3-5, 2003. Addressing findings.
Herschel	2007	GRN	GRN	GRN	SPIRE kevlar suspension system having manufacturing problems.
Planck	2007	GRN	GRN	GRN	Cryocooler meeting held with ESA. Potential solution developed.
EUSO	2008			GRN	Recently selected Explorer Mission of Opportunity for ESA ISS mission.
LISA	2011	GRN	GRN	GRN	List and mgmt meeting schedule for July 5-9, 2003 in Pisa, Italy.
Con-X	2013	GRN	GRN	GRN	All technology areas progressing well.
Balloons	Ongoing	GRN	GRN	GRN	Flew 70 marble Hall of Fame presentation gauges to replace set lost on Columbia.

GRN	Proceeding on Plan, only normal, minor problems
YEL	Significant Problems or Concerns but feasible plan to resolve
RED	Major Problems; Solution path unclear



# Astronomical Search for Origins

## Developmental Mission Status

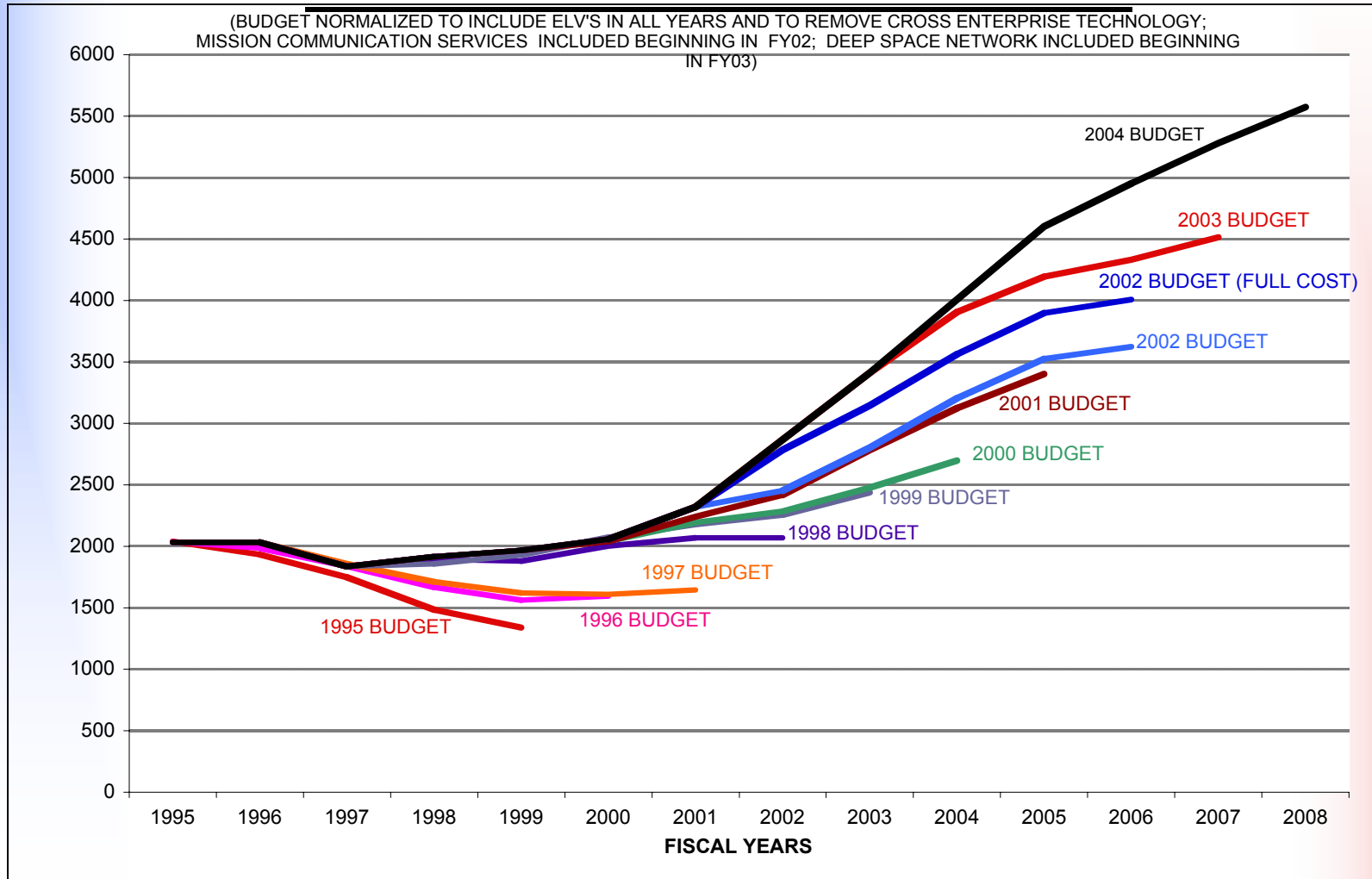
	Launch	Apr	May	Jun	STATUS
SIRTF	Aug '03	GRN	GRN	GRN	Observatory ready for launch.
		RED	RED	GRN	Rocket booster delam process now in place for certification of flight worthiness.
HST	Feb '05	YEL	YEL	YEL	Lack of a defined launch date for SM4 introduces uncertainty in projected ability of the obs. to continue normal ops if date slips beyond late 2005.
SOFIA	Apr '05	GRN	GRN	GRN	First power-on activation of the telescope assembly achieved, plus rotation accomplished -- in position for primary mirror installation in July.
Keck Interferometer	2005	GRN	GRN	GRN	State Hearing Officer rec. granting permit upon approval of mgmt plan (by 12-31)
		RED	RED	RED	2nd sci paper (to <i>Nature</i> on MGC4151) in prep.
LBTI	Sep '06	GRN	GRN	GRN	PLRA in last comment rev cycle. Phase E, Commissioning & Ops & Maintenance, Confirmation Review scheduled for July 8, 2003.
Kepler	2007	GRN	GRN	GRN	Received evaluation grade CCD's from vendor.
SIM	Dec '09	GRN	GRN	GRN	ICR held June 18. Received OSS approval to proceed into Phase B.
JWST	Aug '11	YEL	YEL	YEL	Delta-MDR/Initial Confirmation Assessment: June 17-20. Working toward confirmation for Phase B.
TPF	tbd	GRN	GRN	GRN	Technology demonstration mirror and all cryocooler contracts have been successfully negotiated.

GRN
YEL
RED

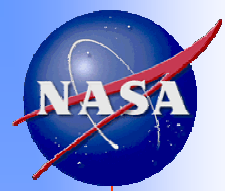
Proceeding on Plan, only normal, minor problems

Significant Problems or Concerns but feasible plan to resolve

Major Problems; Solution path unclear

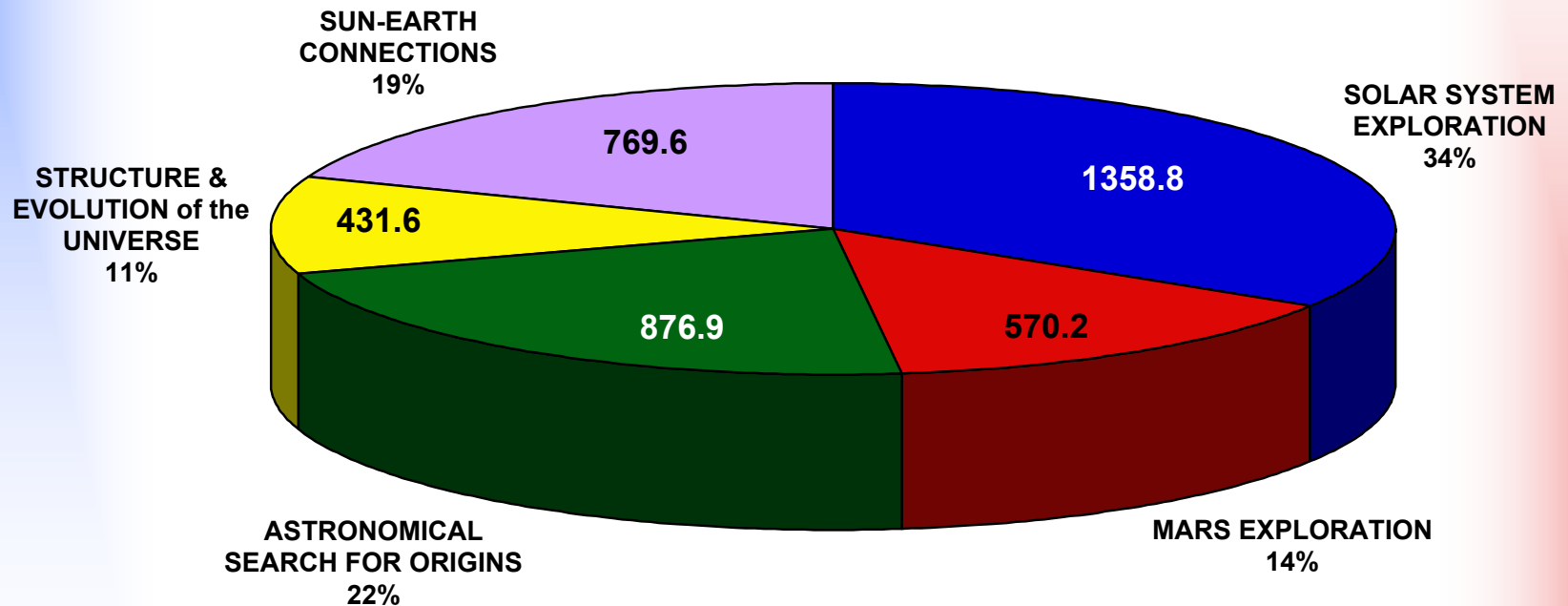


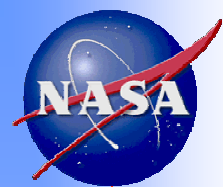




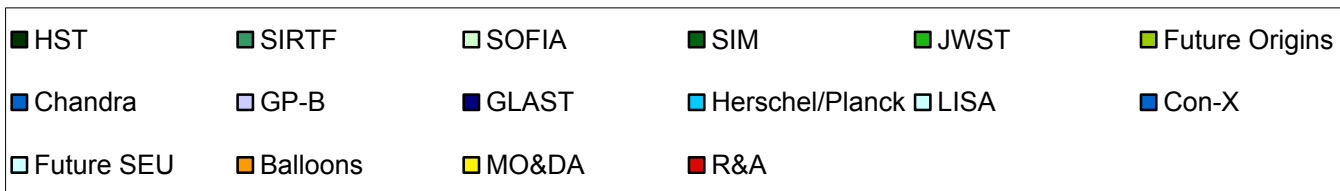
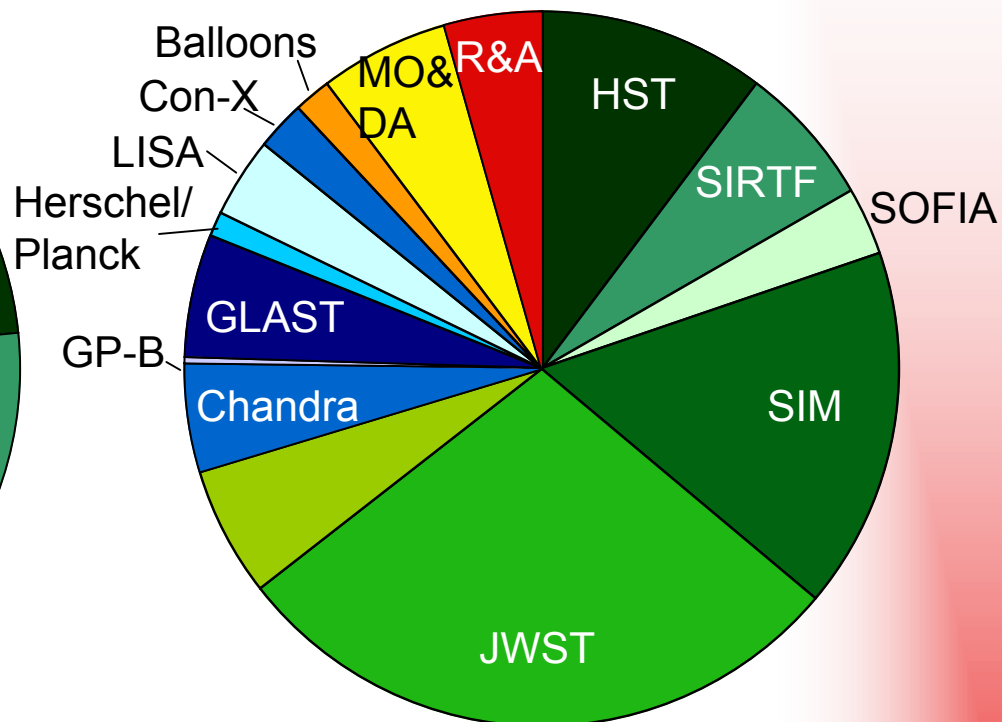
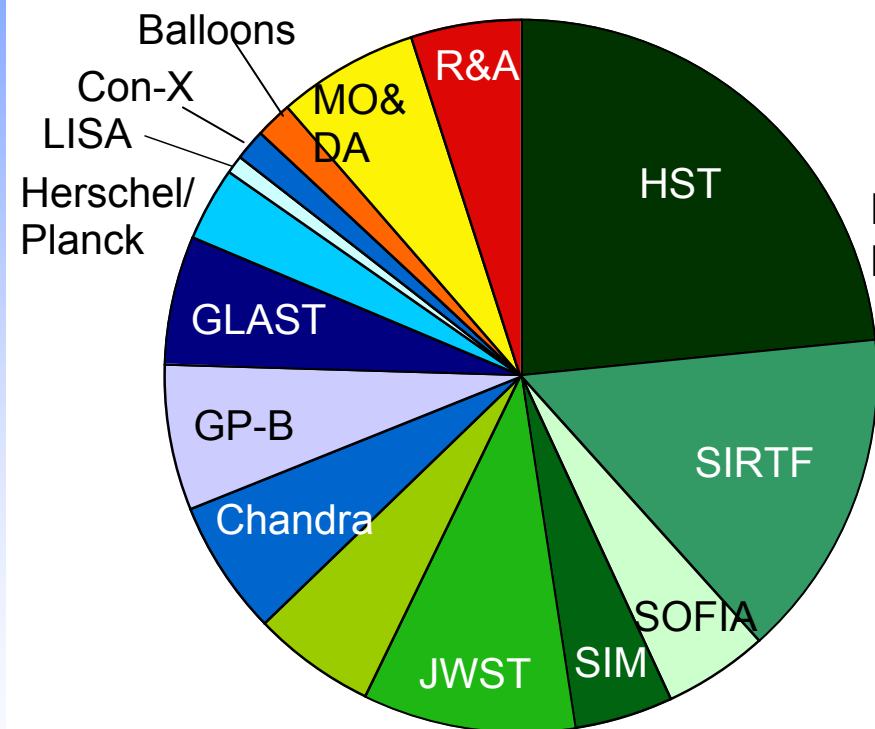
# Space Science Budget

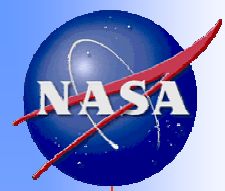
## Full-Cost FY04 President's Request





# Astronomy and Physics FY'03 vs FY'06 Budgets





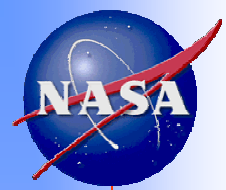
# Space Science Budget

## FY 2004 New Content

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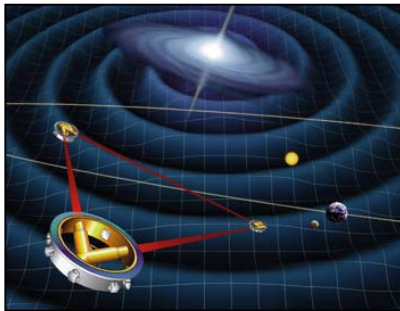
- Incorporates the existing NSI program and the new Jupiter Icy Moons Orbiter (JIMO) mission into a new initiative called Project Prometheus.
- Establishes an Optical Communications program, which enables revolutionary new data communications/transmission.
- Provides development funding for three key elements of the Beyond Einstein program: Constellation X, LISA and Einstein Probes.

Supports increased activity in priority programs



# Beyond Einstein

- Significant expansion of efforts in NASA's Structure and Evolution of the Universe (SEU) theme, addressing its highest priorities as determined by the National Academy of Sciences' Decadal Survey.
- Funding for full development of two major missions: LISA and Constellation-X.



- Funding to initiate "Einstein Probes," a program that will begin later this decade.
  - this program consists of fully and openly competed missions (in the manner of the Discovery, Explorers, and New Frontiers programs) to conduct investigations that benefit the Beyond Einstein science objectives.